The Feeding Value of Wheat.

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The present high price of corn and the comparatively low price of wheat has caused many inquiries to be made in regard to their relative feeding values. A few years ago, the same problem presented itself and was studied by a number of experiment stations. At the Minnesota Experiment Station, the digestibility of whole and ground wheat was determined, and their value as a dairy food studied. These results are published in Bulletins Nos. 36 and 67.

At the Wisconsin Experiment Station, the comparative values of wheat and corn, when fed alone and in mixtures for pork production, were determined. The Ohio Experiment Station fed steers on rations containing wheat and corn as the main part of the grain ration. The Oregon Experiment Station experimented with chopped wheat as a single food and as a part of a grain mixture for pigs. At the Missouri Experiment Station, ground wheat and corn were compared; at the

South Dakota Experiment Station, whole wheat, corn meal and ground wheat were fed. The Cornell University Station conducted experiments with corn meal, and mixed rations for pigs, while at the Kansas Experiment Station, corn meal and ground wheat were compared. The Maine Experiment Station made tests with wheat as a part of a dairy ration. The North Dakota Experiment Station made comparative tests with wheat as a food for horses.

Feeding trials with wheat are reported from ten experiment stations and the Bureau of Animal Industry of the U. S. Department of Agriculture issued a circular in 1894 in regard to the feeding of wheat to animals. In order to give the information desired in regard to the feeding value of wheat, a brief summary is here given of the results obtained at the various experiment stations with wheat as an animal food.

WHEAT AS A FOOD FOR PIGS.

Digestion experiments at the Minnesota Experiment Station have shown that when wheat was ground it was 10 per cent more digestible than when fed whole; all of the nutrients, as protein, ether extract and carbohydrates are about 10 per cent more digestible in ground than in unground wheat. When wheat was fed whole, the loss consisted largely of undigested kernels.

Compared with corn, the ground wheat was found to be somewhat less digestible; when fed under like conditions to pigs the wheat and corn had the following comparative digestibility.

	Per cent digested	
	Ground wheat	Ground corn
Dry matter	82.	90.
Ether Extract (Fat)	70.	78.
Protein	80.	90.
Fiber	60.	48.
Nitrogen free extract (Carbohydrates)	83.	94.

The main difference in the composition of wheat and corn is that wheat contains a larger amount of crude protein and a smaller amount of fat or ether extract than corn. The way in which wheat and corn are combined with other grains and feeds determines their values.

The results obtained at the Wisconsin Experiment Station show that there is practically no difference in the quantity of pork produced from the same weight of wheat or corn. In four trials an average of 499 lbs. of ground wheat were required to produce 100 lbs. of gain in live weight. In two trials with corn meal, 498 lbs. were required to produce 100 lbs. of gain. When a mixture of equal parts of wheat and corn was fed better results were obtained than when either wheat or corn was fed alone. It required 485 lbs. of mixed wheat and corn, half and half, by weight, to produce 100 lbs. of gain in live weight. The conclusions reached are stated in the bulletin as follows: "The stockman can easily compute the value of wheat for feeding hogs by remembering that one bushel of wheat will give about 12 lbs. of increase on the average. When hogs are worth $3 per hundred, then wheat would be worth 36 cents per bushel for feeding; at $4.00 per hundred, wheat would be worth 48 cents for feeding, etc." "Whole wheat cannot be fed dry to hogs successfully. Wheat, when soaked, is very rarely fed. To secure the best results, wheat should be ground and fed moistened with water or milk. Better yet, as our experiments show, it should be mixed with some other grain. In the west this will undoubtedly be corn meal. For pigs and shoats, wheat is undoubtedly superior to corn because it contains more muscle and bone building components." These results are given in the Wisconsin Experiment Station Annual Report, 1895.

The South Dakota Agricultural Experiment Station made comparative tests of whole wheat, ground wheat, and corn meal, as food for pigs. The results are reported in Bulletin No. 38. The experiment lasted 90 days and it was found that 4.91 lbs. of whole wheat were required to produce 1 lb. of gain,

4.58 lbs. of corn meal to produce 1 lb. of gain, and 4.81 lbs. of ground wheat to produce the same result. The wheat fed was of an inferior quality such as would be most likely to be used for the feeding of animals. The pigs were sold for $5.50 per hundred, dressed. At this price the ground wheat gave a return of 58.31 cents per bushel, the whole wheat 53.83 cents per bushel, and the corn 60 cents per bushel. The pork produced from the ground wheat, and that from the corn meal were found to be about equal in quality.

Experiments conducted at the Kansas Experiment Station are reported in Bulletin No. 53. Two series of experiments were conducted; one with fattening pigs, and one with growing pigs. The results of the two trials are given in the following table:

Fattening Pigs—

	Average Weight of Pigs.	Average Daily Gain.	Total Grain Eaten.	Grain Eaten per lb. of Gain.
Corn meal	283	1.70	573.5	4.38
Ground wheat.	300	1.78	564.6	4.11
Growing Pigs—				
Corn meal and Ground wheat.	79.7	.45	278.8	5.52
Corn meal....	64.7	.30	249.8	7.29
Ground wheat.	74.6	.42	264.7	5.59

From the table it will be observed that the ground wheat gave slightly better results for the growing pigs than the corn meal. In the case of the growing animals ground wheat gave slightly better results than the corn meal. The difference, however, is not large. The best results were obtained when a mixture of equal parts of corn meal and ground wheat was fed.

At the Missouri Experiment Station, wheat, as a food for growing pigs, was found to give better results than corn, the best results were obtained when the wheat was fed in combination with other foods. One bushel of chopped wheat, soaked, made 13.2 lbs. of growth; one bushel of chopped wheat, dry, made 12.6 lbs. of growth, while one bushel of whole wheat made 11.4 lbs. of growth, and one bushel of corn, chopped,

made 10.3 lbs. Wheat was found to be superior to corn for growing pigs, but neither wheat nor corn gave the best results when fed alone.

At the Cornell University Experiment Station, a test was made of the comparative feeding values of ground wheat and corn meal, and also of a mixture consisting of 26 lbs. of gluten feed and 100 lbs.corn meal. The gluten feed and corn meal mixture was prepared so as to have the same nutritive ratio as ground wheat. To each of the three lots of animals skim milk was fed alike. The results of the experiment are reported in Bulletin No. 89. Wheat alone made a somewhat better showing than corn meal. "The corn meal lot consumed the least food and made the least growth, while the mixed corn and gluten meal gave the greatest gain and produced cheaper pork than ground wheat." The experiment showed that neither wheat nor corn, when fed alone, produced the best results.

At the Oregon Experiment Station, sheaf wheat was fed to pigs. The animals did not relish the sheaf wheat. It cost more to make 100 lbs. of gain in live weight on sheaf wheat than on ground wheat. Sheaf wheat was not found to be a satisfactory feed for pigs. "Pigs do not like sheaf wheat. The wheat is not well digested. It cost more to put on fat with sheaf wheat than with ground grain." A mixture of grains was found to give better results than wheat alone.

When chopped wheat was fed in another series of tests, a bushel of wheat produced a gain of 12.9 lbs., while a bushel of wheat in the mixed grain ration made a gain of 14 lbs. When the animals were slaughtered, those fed on wheat showed the greatest weight of intestines, while the intestines and internal organs of the lot fed on the mixed grain ration were in a more healthy condition than the lot fed on wheat alone

WHEAT AS A FOOD FOR STEERS.

At the Ohio Experiment Station, a comparison was made of the feeding values of corn meal and wheat meal for beef production. The experiment was continued for two years.

Wheat bran was used as a part of the ration. Equal parts of corn meal and wheat bran were mixed and then, after the animals became accustomed to the feed, oil meal was added until it amounted to one fourth of the entire grain ration. The coarse fodder consisted of clover hay, and corn silage. To part of the steers, wheat meal was substituted in the ration for corn meal; all other feeds remaining the same. It was found that 15 to 16 lbs. per day, of the corn meal mixture could be fed without experiencing difficulties.

The results of the first year's feeding were slightly in favor of the wheat meal. The second year, corn meal appeared to give somewhat better results. The results of the two years' trial are summarized in the following table:

	Daily Gains per Steer lbs.	Dry Substance per lb. of Gain.	Cost of Food per lb of Gain Cents.
1894			
Corn meal	2.07	10.31	7.79
Wheat meal	1.98	10.02	7.75
1895			
Corn meal	2.02	9.90	7.01
Wheat meal	1.70	11.78	8.95

At the time the experiment was performed, corn meal cost $16.00 per ton, while the wheat meal cost $20.00 per ton. The wheat bran, which formed a portion of each ration, cost $16.00 per ton.

At the Pennsylvania Station no great difference was observed between the feeding value of wheat meal and the same weight of shelled corn as corn and cob meal. The corn and cob meal gave slightly better results than the wheat.

WHEAT AS A FOOD FOR DAIRY COWS.

At the Minnesota Experiment Station, it was found that when wheat was fed in a ration at the rate of 7 lbs. per day, and was mixed with 6 lbs. of bran and 1 lb. oil meal, the results were practically the same as when 3 lbs. of corn and 4 lbs. of barley were fed in place of 7 lbs. of wheat. That is, 7 lbs. of ground corn and barley produced the same results in a dairy

ration as 7 lbs. of ground wheat. "It appears that there is practically no difference between the feeding value in weight of ground wheat and ground corn and barley."

When wheat was fed at the Maine Experiment Station, the results in milk yield and fat content of milk were nearly the same as when corn meal was fed. Corn meal and wheat meal were considered to be about equal in feeding value for dairy animals.

At the Ontario Agricultural College, wheat meal did not produce as good results as a ration consisting of one-half oats and one-fourth each of ground barley and peas. The mixed grain ration gave better results than the ground wheat ration.

WHEAT AS A FOOD FOR HORSES.

Wheat as a food for horses was tested at the North Dakota Experiment Station. The results are published in Bulletin No. 20 of that Station. The wheat was fed at the rate of 14 lbs. daily, and the horses were given an average day's work. It was found that wheat alone was not a satisfactory grain ration for a work horse. There was a tendency for the horses to get "off feed" and for the digestion to become deranged. No tests are reported where wheat formed a part of the grain ration for work horses; upon this point, Dr. Salmon, of the Bureau of Animal Industry, U. S. Department of Agriculture, gives suggestions in a circular of information issued in 1894.

"There are certain points to be borne in mind when one is commencing to feed wheat. Our domesticated animals are all very fond of it, but are not accustomed to eating it. Precautions should consequently be observed to prevent accidents and disease from its use. It is a matter of common observation that when full fed horses are changed from old to new oats they are liable to attacks of indigestion, colic, and founder. If such results follow the change from old to new oats, how much more likely are they to follow a radical change, such as that from oats to wheat? For this reason, wheat should, at

first, be fed in small quantities. It should, when possible, be mixed with some other grain, and care should be taken to prevent any one animal from getting more than the quantity intended for it.

"These precautions are especially necessary when wheat is fed to horses, as these animals are peculiarly liable to colic and other disturbances of the digestive organs, accompanied or followed by laminitis. Cattle, sheep and hogs frequently crowd each other from the feeding troughs, in which case some individuals obtain more than their share, and may bring on serious or fatal attacks of indigestion.

"The best form in which to feed wheat is to roll or grind it into a coarse meal. It may then be fed alone, or mixed with corn meal, or ground oats. When ground fine it is pasty and adheres to the teeth, gums, and cheeks so that it is not so readily masticated or eaten. In the form of a coarse meal it is relished by all animals, it is in a condition to be attacked by the digestive processes whether thoroughly masticated or not, and in most cases it gives the best results. Dr. Gilbert appears to have obtained better results from whole than from ground wheat when fed to sheep. Sheep feeders may, therefore, experiment with whole wheat, but wheat meal will certainly be found to give better results with all other kinds of animals."

Dr. Salmon considers that it is preferable to feed equal parts of wheat and corn for fattening animals than either of the grains alone. Wheat is better for growing animals; corn, he considers, has a higher value for fattening animals than the tables of composition and the German standards indicate.

SUMMARY.

The results obtained when wheat was fed at the various experiment stations show that, as a food for growing pigs, it is somewhat preferable to corn; but that for fattening pigs there is but little difference between wheat and corn. The best results, however, are obtained when wheat is ground and fed with

other grains. A mixture of equal parts of ground wheat and corn gives better results than either wheat or corn when fed alone. Experiments show that ground wheat is ten per cent more digestible than whole wheat. When the price of wheat is low and it can be purchased for the same price per pound or less than corn, it will pay to use wheat in a ration. The manure from wheat fed animals is more valuable than that from corn fed animals. As a food for dairy animals, ground wheat has been found to be fully equal to either corn or a mixture of corn and barley, and when fed to fattening steers, ground wheat produced about the same results in a ration as ground corn. From the experiments that have been conducted, it would appear that the value of wheat, as a food, depends, to a great extent upon the way in which it is fed, and the foods with which it is combined. When properly used and combined with other grains, wheat is a valuable animal food. In addition to its being equal to corn for fattening animals, and superior to corn for growing animals, it is also equal to corn in a dairy ration.

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